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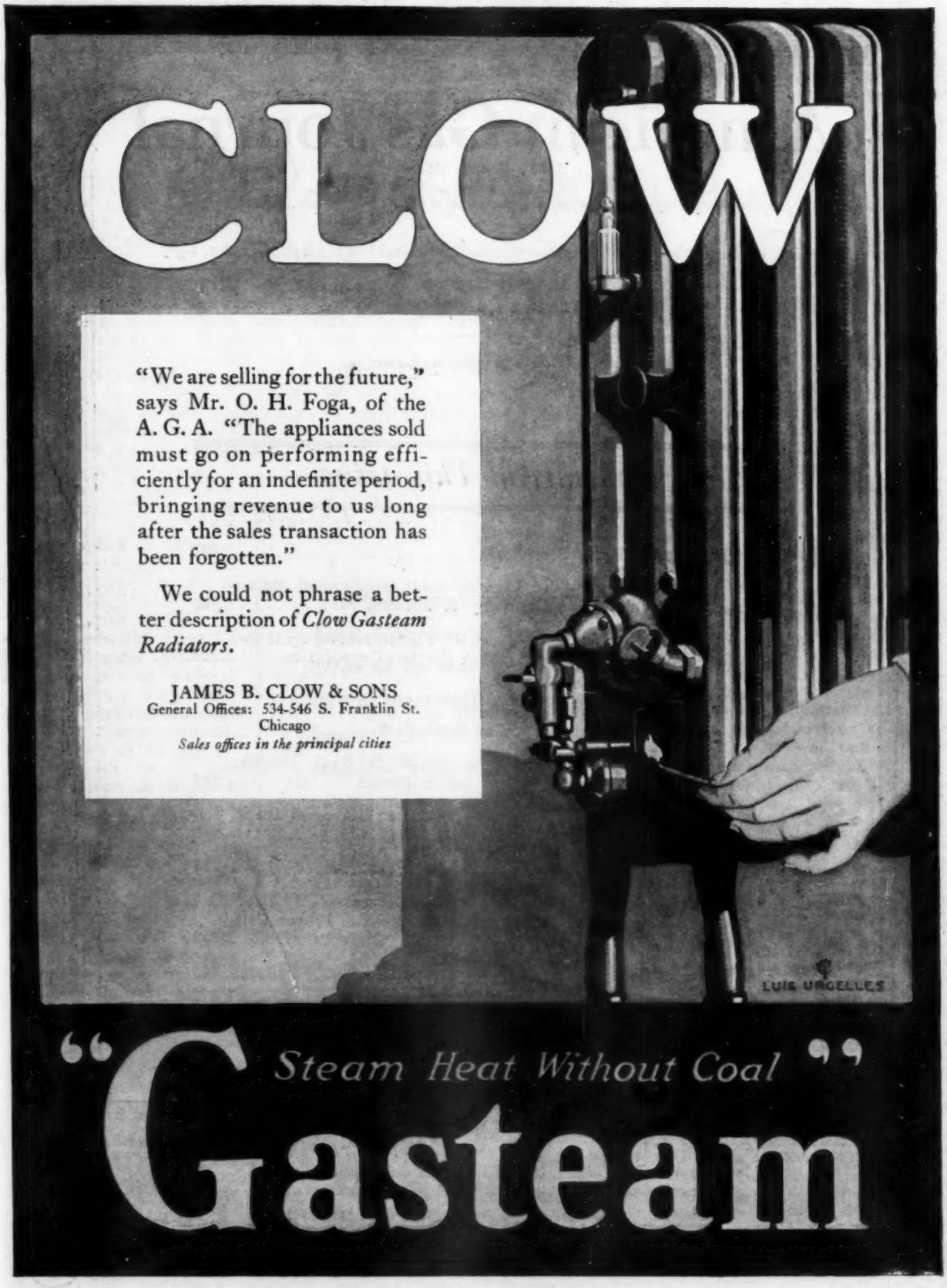
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American Gas Journal

SIXTY-THIRD YEAR

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New York City on B.T.U. Basis

Order Effective Oct. 1 Makes Radical Change

Under an order of the New York State Public Service Commission, which was entered Aug. 31, Greater New York City, on Oct. 1, next, will change from a twenty-two candle-power gas to a B.t.u. gas with a minimum of 525 per thousand cubic feet. At the same time a general reduction of 10 cents per thousand will go into effect. An important feature of the order was the establishing of a block rate for consumers by which the price of gas will be graded down to 95 cents per thousand for large consumers.

The reduction ends for the time all controversies over the question of gas rates which have been agitated since April 25, 1919, when the Consolidated company instituted its suit in the Federal court to have the 80-cent gas law declared confiscatory and unconstitutional, which was so decided by the United States Supreme Court on March 6 last. During this litigation all of the other gas companies began similar suits and succeeded in having the way cleared so that higher rates might be charged.

The Consolidated company advanced its charge at various times until it reached $1.50 per thousand cubic feet. Last August it voluntarily reduced the price of $1.25. All of the other companies made similar increases, and then all of them began filing applications with the commission for authority to charge still higher rates. It was believed that these applications were made for the purpose of diverting the commission from its purpose of ordering reductions.

When the increases were permitted the companies were directed to impound all of the money collected for gas in excess of the legal rate. When the Supreme Court disposed of the matter by sustaining the findings of the lower courts this money was refunded. A statement by the assistant corporation counsel, James A. Donnelly, on July 9 last was to the effect that sixteen of the companies had earned an additional $27,378,116.49 by May 1 because of the favorable court decisions, and that the augmented income of the Consolidated company amounted to $13,500,050.42.

The new rates just ordered not only provide for a maximum reduction of 10 cents per thousand cubic feet to householders and to other small consumers up to 100,000 cu. ft., but provide for a further reduction to large consumers. This is the first time that large industrial users of gas will receive the benefit of the block rate, which will bring the minimum rate to users of 1,000,000 or more cubic feet down to 95 cents. This reduction, it was explained, will affect practically all companies.

Antediluvian, antiquated New York City has at last seen the error of its way and the largest city in the world (see last census figures) is to have the B.t.u. standard in place of the obsolete candle-power one. This is a step in the right direction.—Editor.

A statement issued by the commission said that the present action was the result of an exhaustive study of the gas situation of more than four months, that every gas company in the city had petitioned the commission for increased rates and that for the purpose of hastening the inquiry the companies were bunched together in one general investigation. A joint committee composed of representatives of the gas companies, the Merchants' Association and large industrial users of gas and an engineer of the commission, was appointed. This committee reported in favor of changing the lighting standard for measuring gas to the heating standard and in favor of adopting the block method for charging the big consumers with gas.

All of the gas companies in the city will, after Oct. 1, charge a maximum of $1.15 per thousand cubic feet of gas, graduated down to 95 cents for large users, with these exceptions: The Bronx Gas & Electric Company, from $1.50 to $1.45; New York & Queens Company, from $1.25 and a 75-cent service charge to $1.15 and a service charge; Queens Borough Gas Company, from $1.50 to $1.30; Brooklyn

Borough Gas Company, from $1.35 to $1.30; Kings County Lighting Company, from $1.40 to $1.30, and the New York & Richmond Company, from $1.25 and a service charge of 75 cents to $1.20 and a service charge.

Table of Old and New Rates

The following table shows the present rate charged by the various companies and the rate fixed by the commission beginning Oct. 1:

Company	Present Rates	Rates After Oct. 1
Consolidated Gas	$1.25	$1.15
Central Union	1.25	1.15
Northern Union	1.25	1.15
New York Mutual	1.25	1.15
Standard	1.25	1.15
New Amsterdam	1.25	1.15
East River	1.25	1.15
New York & Queens	*1.25	*1.15
Bronx Gas & Electric	1.50	1.45
Brooklyn Union	1.25	1.15
Newtown	1.15	1.15
Richmond Hill & Queens	1.20	1.15
Jamaica	1.20	1.15
Woodhaven	1.20	1.15
Flatbush	1.10	1.15
Queens Borough	1.50	1.30
	and 1.40	1.30
Brooklyn Borough	1.35	1.30
New York & Richmond	*1.25	*1.20
Kings County	1.40	1.30
Westchester	1.25	1.15

*And a 75-cent service charge.

One important feature of the commission's order provides that the gas companies must furnish consumers with gas mantles at cost. The B.t.u. standard fixed by the commission is between 537 and 525 units.

In making public the order of the commission, Chairman William A. Prendergast issued a statement in which he said:

"The action taken by the commission will mean a per annum saving to the people of New York City of approximately five and one-half millions of dollars. This will be brought about at the same time that they will receive a quality of gas better suited to their purposes than the present obsolete and uneconomical candle-power gas which has been abandoned practically everywhere in the United States. When some people will undertake to say that we have lowered the standard, let the public understand that this is not true. The B.t.u. standard is a different standard and one which is more applicable to the present household and industrial uses of gas than the old standard ever was.

Heating Standard Defended

"The conclusive answer to all questions on this subject is that when the people of Boston, Philadelphia, Chicago, St. Louis, Baltimore, San Francisco and every other city of consequence, have found the B.t.u. standard the best adapted to their purposes, the people of New York need have no misgivings concerning the change, no matter how radical it may be made to appear. The commission has found no opposition to the proposed change except from the political side of the present city administration.

"The commission believes the rates now provided to be the most advantageous that can, with reason, be fixed at this time. They have been forced upon the companies. It, therefore, asks the public to have confidence that they represent the best that can be done. It bases its belief upon the investigations which it has made and which it considers to have been been thorough and fair. It has the advantage of having worked upon and based its action upon facts. In order that no one need be deceived by the demands that have been made by some of the city authorities for a return to the 80-cent rate, we wish to say to the public in all candor, and as a statement of fact, that there is no company in the City of New York that can afford to sell gas at 80 cents at this time.

"The cost of producing and distributing gas, without taking into consideration certain taxes and a return upon investment, amounts to more than 80 cents. If, in the face of what is the commission's positive knowledge on this subject, there should continue to be any recurrence of a demand for the 80-cent rate at this time, it will be evident that those indulging in it have no other thought than to deceive the public for their own selfish motives. The commission would be delighted to offer the people of New York a lower rate than the one now fixed, and will be prepared to do so when a lower rate can be justly fixed. But we want the public to know the facts.

Merger Plan Agreed to

"A question which has been a disturbing influence in the past is the fact that there are a large number of companies operating as independent corporations, but really under central control.

"The consolidated system is prepared to undertake a merger of all its companies and the Brooklyn Union system likewise. This is particularly important as it affects the Brooklyn subsidiary companies because some of them have not been sufficiently independent financially to undertake extensions and improvements that have been demanded by the public in the suburban districts. With one financially competent company with which to deal these difficulties will be removed.

"The commission has sought, and will continue to seek, a constructive solution of the public problems entrusted to it. But it is not to be swerved from its purpose or influenced in the slightest degree by those who deal in nothing but destructive criticisms or suggestions based on fallacies."

The present rate, it was stated, has been consented to by the Consolidated and Brooklyn Union Gas companies, which, with their subsidiaries, practically control the gas situation in the city. Their acquiescence in the reductions means the consent of all of the smaller companies.

Statement by Consolidated

In a statement by Robert A. Carter, vice-president

of the Consolidated Gas Company, notice is served that the company, in accepting the order of the commission, reserves all of its rights:

"The gas rates fixed by the order of the Public Service Commission for the Consolidated system companies are not adequate under present conditions, or any conditions which can now be regarded as reasonably in prospect. They do not allow an adequate rate of return upon even the indisputable amount of the actual investment in our gas properties, as found by the commission. The courts have held that we are entitled to earn a fair return upon the present cost to reproduce our properties, which the commission admits would be very much more than the original investment.

"The rates fixed by the commission make no allowance for reimbursement to these companies of any part of the deficiencies in earnings, amounting to about $54,891,530.19, sustained by them since Jan. 1, 1917, the period during which these companies have been struggling to obtain relief from confiscatory statutory rates. We believe we are entitled, under the decisions, to be reimbursed for losses during this period; the commission has left all this out of account.

"The rates fixed by the commission likewise take no account and make no provision for the present high prices of anthracite and bituminous coal and of coke, these fuel prices are now higher than they were at any time during the war period. If these conditions continue until, by reason of exhaustion of coal on hand, these companies are compelled to purchase and use large quantities of coke and coal at such prices as those now prevailing, the rates now required by the commission would become entirely inadequate. The actual existent conditions as to the cost of coal, oil and labor do not warrant the reductions in rates prescribed by the commission."

An Inventory of Meters*

Its Plan and Purpose Outlined

By CHARLES SCOTT, Application Department, Consumers Gas Company of Toronto

This paper has been prepared for the express purpose of assisting gas companies that are in need of information as to the best way to check the records of all meters, in or out of use.

It is not the writer's wish to convey the idea that the system here presented is the most satisfactory way out of the difficulties surrounding the inventory of gas meters, but it is so far the best system that our company has found for keeping close tab on all its meters in or out of use.

It is therefore hoped that the facts here presented may be of interest and value, and if such be the case the writer will feel amply repaid for the time spent in their preparation.

A company may justly be proud of its systems and the efficiency of its clerks, but we all recognize that to err is human, and clerks, with the best of intentions, sometimes fail. The possibility of failure of a "meter on" order reaching the ledger keeper or the chance of some consumers not being correctly billed is the fundamental reason for having a meter inventory. Opinions may differ as to how often such an inventory should be made, but probably every five years would be a reasonable period.

We take it for granted that every company operates a meter record file for the purpose of recording the transactions of its meters. It might be well to describe our meter record file, and give some idea of the information which it contains, and the method of its operation. The file contains approximately 160,000 white cards, size 4x6 in. The size of meter, company's number, maker's number and name, appear at the top of the card, and below this the card is divided into columns, headed as follows: Consumer's name and address, on and off dates and shop and G. I. tests. The cards are filed in numerical order and are subdivided by special tab cards. Every fiftieth number is distinguished by a pink card. The hundredth number by a blue card, and the thousandth number by a special heavy strawboard card, which is also used as a throw card. This card prevents damage to the edges of the ordinary cards.

Preparation of Record Cards

The name and address of the consumer, together with the information, "on and off" date, is written by the clerk on the ruled lines on the body of the card. On the side column of the card all meter shop tests are registered, with the date of Government inspection. The information for reverification of meters within the six-year period is taken from these record cards. (Fig. 1.)

In thinking out the plan of checking this record file, it was thought advisable to have a miniature ledger card written, with the information of the consumer's name and address, and the number of the meter in use, and to re-sort these cards numerically to check with meter record file.

For this purpose, cards of three-inch by five-inch size were provided in special colors to designate different classes of meters. A yellow card was written for meters in stock. A white card was used for active consumers, and a red card denoted a locked meter. (Figs. 2 and 3.)

By "active consumers" it was understood to represent the meters on which bills were being rendered monthly as shown by the ledgers.

Locked meters were the meters still on the consumers' premises and no bill being rendered.

As the writing of the white cards was to entail considerable amount of clerical labor, it was decided to have the addressograph department print on the card the consumer's name and address, the same as

*Paper read at Canadian Gas Association meeting.

would be printed on the gas bill. Thus when the actual copying of the information from the ledger was done, all that was necessary was to write the company number of the meter on the card. It was understood that in the event of a white card being found missing, the ledger keeper was to write one to replace it.

Printing Helps Prevent Errors

On the yellow cards for "meters in stock" it was possible to print the wording, "Company number and maker's number." This helped to prevent the possi-

FIG. 1.

104888	146205	STANDARD	5 LIGHT METER.	
ON	NAME	ADDRESS	OFF	SHOP—G.I. TEST
Aug 5th	J A McDonald	614 Bloor St. W.		APPL. DEPT. NOV. -5- 1921

bility of an error in writing the numbers, considering the cards had to be written by the different departments at the shop.

Taking Inventory

There has been no special time fixed for the work of taking a meter inventory. A meeting was held and it was decided that Nov. 5, 1921, was a suitable date. Preparations were made to have all cards printed and in the hands of the responsible persons at least four days before that date.

The work of recording the meter numbers, etc., on the yellow cards was commenced on the afternoon of Saturday, Nov. 5. The following Monday was a public holiday, giving further opportunity to finish up the work, when the traffic in meters was practically at a standstill. As the cards were written, they were placed in boxes, each containing 1,000 cards. These boxes were returned to the application department by Nov. 9, complete and ready for sorting.

As the "on" and "off" entries had to be posted up to Nov. 5 on the ledgers, sufficient time was allowed before the start of writing the white cards was made. This work was commenced on the Saturday afternoon, Nov. 12, by a special augmented staff of clerks on the ledgers. All traffic in the "on" and "off" orders was held up until every white card had been written. The special staff worked on Monday and Tuesday evenings before completing all the cards.

When all the cards were written, the actual work of assorting commenced. A number of wooden compartments were made to fit on the desks, and into these were placed the sorted cards, according to meter sizes. As many as twenty-four desks were used at one time in sorting these cards.

After the cards were sorted into meter sizes, the labels on the compartments were changed for numerical sorting. In the first compartment, the numbers ranging from 10,000 and upwards were placed. The second compartment 11,000, the third 12,000, and so on up to 108,000, the highest series of numbers required. Then followed the sorting of the cards into the 1,000 series. Again they were sorted into 100 lots. The final sorting was done in strictly numerical order from one upwards.

Trouble Ahead

It was apparent at this stage of the work that considerable trouble was ahead, due to the ever-increasing number of duplicate cards, etc. These cards were filed as original copies and could only be determined as to their correctness by checking them with the meter-record card.

In comparing the meter-record card with the inventory card, it was necessary, if found correct, that a stamp or symbol be placed on both cards as an O. K. mark. For this purpose, a rubber stamp was provided with the following wording, viz.: "Application department, Nov. 5, 1921." The imprint of this stamp was placed in the right-hand corner of the meter card when the record agreed with that of the white, red or yellow inventory card. The inventory card was also stamped.

The actual work of checking the cards was done by two specially trained clerks. The work was necessarily very slow as great care had to be exercised in stamping off the right card and making minor adjustments to the name and address on the meter-record cards. Where the record was found to be different, whether by meter number or street address, the cards were returned to the ledger departmnt for reverification. To give some idea as to what extent this work entailed, there were over 5,000 cards returned for reverification. Correction of house num-

FIG. 2.

Size	Co. No.	Mkrs. No.
5	104888	146205

APPL. DEPT. NOV. -5- 1921

FIG. 3.

J. A. McDonald,
614 Bloor St., W.
5/104888

APPL. DEPT. NOV. -5- 1921

bers and street names were very numerous, owing to the many changes of street and house numbers throughout the city.

"Snag Box"

The duplicate and incorrect cards were placed in a special box which was commonly called the "snag box." As the posting progressed, the work of one clerk was employed in investigating the cards in this box. It is needless to say that great patience and ingenuity had to be used in solving the many problems of the "snag box."

When all the cards had been verified attention was given to meters condemned, sold, destroyed by fire, and lost or stolen. The "destroyed record books," from the meter stock-keeping department, were bor-

rowed, and a white slip written for each entry in the books. These were sorted in numerical order and checked off with the meter-record card.

In the final analysis, we found there were quite a few meters on the unaccounted-for list.

Meters On—No record.
Meters Locked—No record.
Meters Detsroyed—Not entered.
Meters in Stock—No record.
Meters Locked—Overdue.
Miscellaneous.

Investigation is still being carried on, and almost daily, fresh clues are coming to light that help us solve the mysteries of the incomplete records, so that now there are only a few meters unaccounted for.

From what has been accomplished so far, we feel that the time and labor spent in making this inventory has been of inestimable value. It has, as expected, brought to light errors and discrepancies in our system, the discovery of which will be of lasting profit, and now we have the satisfaction of being assured that a thorough accounting has been made of all meters.

A. G. A. Prepares for Convention

A. C. Fuller, president of the Fuller Brush Company, Hartford, Conn., will deliver the principal address at the meeting of the Manufacturers' Section at the coming Atlantic City convention of the association. Mr. Fuller's topic will be "Selling the Gas Bill." Mr. Fuller has attained a nation-wide reputation in the commercial world and his message to gasmen will be a good one.

Within another ten days the association will place in the mails 30,000 copies of a large broadside addressed to a selected list of architects, building contractors, heating and ventilating engineers, hardware dealers, hospital and institution managers, hotel managers and plumbers. The broadside will be done in colors and will feature the statement, "Go to Atlantic City for the biggest gas appliance exhibition ever given." In the body of the broadside, under the general title of "Under one roof you will find gathered together the largest and most complete exhibit of gas appliances ever shown," there will be listed the names of the exhibitors. The purpose of this broadside is to boost the attendance at the convention and to call to the attention of those interests closely allied with the gas industry the tremendous advantages to be had each year from meeting executives in the gas business and of tying in with their activities.

An innovation this year will be the meeting of the directors of State committees on public utility information. This meeting will be open to all who attend the convention, and it will afford an excellent opportunity for those who are interested in the work being accomplished by these publicity men to listen in to their discussions and to meet them personally. Three papers will be read, all of them touching intimately on the work that is being done, and discussions of these papers will be made by practically all of the eighteen directors who are at present working in behalf of better public relations for the industry.

The association has already prepared an attractive booklet, entitled "Hints for the Housewife," which will be distributed free of charge to the women attending the lectures on domestic science to be given by Mrs. Anna J. Peterson on Wednesday and Thursday mornings. Following the convention, this booklet will be issued to gas companies for distribution direct to their customers.

Reservations for hotel accommodations are being made in generous number and the outlook is for a convention of bigger attendance than ever before. Recent favorable developments in the coal situation will all tend to increase the attendance and no difficulty in passage transportation facilities to the convention is anticipated.

Determination of Hydrogen in Coal

A new method for determining the available hydrogen in coal has been developed at the experiment station of the United States Bureau of Mines at Pittsburgh, Pa. Details of the new method will be given before the fuel section of the American Chemical Society meeting in Pittsburgh this month.

Get the Best Out of the Old Plant

Don't junk your old power plant equipment for the purchase of new equipment, unless you are sure that correct combustion methods are getting the best results out of the old plant, advises the United States Bureau of Mines. The fuel economy of the plant may be better than its anxious friends realize. For instance, a watchful superintendent of a Government plant, knowing that improvements in plant equipment had been made since his stokers were installed, was almost persuaded to substitute a new type. The Bureau of Mines was asked to ascertain the actual performance of the old stokers, and found the plant already doing from 3 to 5 per cent better than was promised for the new equipment. Details of the bureau's experimental work in determining the potential plant performance in the case referred to are given in Serial 2373, "Fuel Economy from Old Plant Equipment," which has just been published.

Study of Hearth Gases from Blast Furnaces

In the course of the study of hearth gases from blast furnaces, being made by G. St. J. Perrott, physical organic chemist of the Bureau of Mines, at the Southern experiment station, Birmingham, Tuscaloosa, Ala., the results of sampling hearth gases of four blast furnaces have so far shown no difference in the combustibility of different cokes in the hearth of the blast furnace. There is a difference in the rate of reaction of different kinds of coke with carbon dioxide at a temperature of 1,000 deg. Cent. These results are corroborating the combustion experiments that are being carried on by John Blizard, fuel engineer, in the Kreisinger furnace. The suggestion has been offered that combustibility tests be made in a small furnace at the lowest possible rate at which combustion may be maintained in order to determine if there is a different influence of the various kinds of coke on the rate of combustion at low temperatures. It may be that combustibility of coke in the blast furnace is significant not at the hearth but while up in the furnace, where the temperatures are much lower. This problem will have to be attacked by getting gas samples higher up in the furnace. It is hoped to make an arrangement with a blast furnace operator to take samples higher up on the bosh. It has been suggested that special bosh plates be made with openings for gas-sampling tubes. It is hoped to find some blast furnace operator who will co-operate in using such special bosh plates.

Accident and Fire Prevention

Paper Read Before Canadian Gas Association

By F. W. FISHER, Employment and Safety Manager, Rochester Gas & Electric Corporation

It is assumed in this consideration of accident and fire prevention in gas manufacturing properties that the gas fraternity to which the paper is addressed is to some extent familiar with the general safety movement and the special work in this field applicable to gas manufacturing properties which has already been done. This work is so extensive and valuable as to be reasonably complete in many particulars. I refer to the reports, standards and data of such organizations as the Canadian Gas Association, the American Gas Association, the National Safety Council, the National Electric Light Association, various insurance organizations, the United States Government, etc. In many manufacturing enterprises, including gas manufacture, the hazards of slipping, tripping, falling, being cut by tools, injured by machinery in motion such as elevators, coal crushers, belt conveyors, prime movers, etc., are similar, and have been adequately considered by others. Likewise the reduction of accidents through engineering design, safety organizations, good housekeeping, guarding, replacements of equipment and sanitation are accomplished in a gas works just the same as in any other industry having similar problems. The information now available on these subjects as well as on many of the specific hazards of gas manufacture is very comprehensive and will be only briefly referred to here. It should be studied not only for the solution of specific problems, but in order to acquire a true perspective of the safety field.

This resume must necessarily be general, somewhat superficial and colored by personal experience. It, together with any new ideas, is not presented as a dogmatic exposition of finalities, but as a contribution to the growing and changing thought of an evolutionary movement of great economic importance.

In considering the accident and fire hazards in gas properties it is important to correct the erroneous though common impression that gas works operation is particularly hazardous, for experience shows that gas and electric properties of about the same size and operated with approximately the same relative efficiency, have practically the same accident cost. This, for example, in the company which I represent has averaged for the past five years about 0.6 of 1 per cent of the gross earnings in each department respectively. It is true that possibilities of serious accident, catastrophe or conflagration do exist in gas properties to a greater degree than in the majority of business or manufacturing enterprises, but these possibilities are well recognized, and have been brought under a very high degree of control with a corresponding reduction of the probabilities of human injury and financial loss.

It is generally agreed that the most effective method of reducing accidents in industrial establishments is through a safety organization, and the operation of a safety organization in a gas works in particular is easier than in many other enterprises for several reasons. The general organization is composed of a comparatively small number of men. These in general work for the same or slightly larger wages than that prevailing for the same class of work in the community, while the occupation in which they are egaged is comparatively permanent. Public utility operators as a class are good business men who know how to get results. These factors, among others, insure a somewhat higher type of employee, accident prevention work is conducted upon a business basis, and consequently a safety organization is considerably more stable and efficient than the average.

Our Safety Work Different

The form of safety organization for gas companies which I endorse most fully departs radically from that generally recognized by industry, principally because the work of gas companies is highly specialized and technical. This form or system is intended to localize responsibility, to avoid the error of over-organization, to utilize the best talent available and to omit detail which adds unnecessarily to expense or which may be neglected as the system is subjected to the relentless grind of everyday operation year after year.

It consists of a general safety committee composed of the executive superintendents of the company with subordinate inspection committees composed of assistant superintendents, engineers, foremen, master mechanics and men of superior ability from the ranks. The general committee has charge of all safety work and meets monthly while the inspection committees inspect all company property quarterly in rotation. Suitable forms and procedures are standardized to make the system semi-automatic. Continuously functioning workmen's inspection committees so-called are not recommended for the reason that the problems of inspection require more than average ability, although such committees may, under certain circumstances, be valuable within a department only. The support of the rank and file in accident prevention work, the stimulation of which is one of the major functions of workmen's inspection committees, is more certainly secured and maintained through the support of the management and the discipline of the superintendents and foremen all reinforced by the work of the safety committees and the general propaganda put out by the safety department.

Responsibility Rests with Officials

This form of safety committee properly administered puts the responsibility for accidents where it belongs, viz., on the operating officials. The safety department is thus not a free-lance offshoot of the main organization of the company, but an operating department subservient to all other departments of

the company, and responsible to the management.

Regular departmental operating meetings are now held in practically all modern gas companies as matters of business efficiency, and the accidents which have happened during the interval between meetings should be made a regular order of business in these meetings. Safety propaganda can thus be put across successfully through the operating superintendent, who through his work on the safety committee and through a monthly report on the cost of accidents, to be described later, is kept posted on the accident situation.

Accident seriousness is also minimized by adequate first-aid and medical care. In this connection the very highest type of medical and hospital treatment is not only good ethics but good business, for it will cut down total expense and get injured employees back on the job most quickly. Furthermore good medical attention stimulates belief in and support of accident prevention work throughout the entire organization.

Since permanent success in preventing accidents and minimizing their seriousness are always dependent on the support of the managerial and executive staff of the company, accident statistics focusing attention on accident costs must be regularly prepared. Gas works operating superintendents in particular, upon whom the safety supervisor is dependent for the discipline necessary to make safety work effective, are, regardless of high humanitarian instincts, principally interested in costs. What is believed to be one of the best statistical tabulations to interest these officials and show clearly how accident work is progressing is one which equalizes costs for comparative purposes by taking into account the various degrees of hazards throughout the plant concerned.

Statistics

To make up these statistics the actual cost of accidents for each department is ascertained monthly on a cumulative basis, using the figures for money actually expended plus reserves set aside on uncompleted cases. These costs are divided by the departmental payroll, thus establishing a pure premium. The latter is then divided by the insurance rate for the department, which is the best practical measure of the risk of the work, with the result that the pure premium for each department is equalized and is comparable. Theoretically these adjusted pure premiums should all be equal and their variation gives, figuratively speaking, a yardstick by which to measure the efficiency of individual departments. The cost of accidents per thousand cubic feet of gas produced gives a further comparison which is very useful. A monthly report of this nature stimulates real work, a more careful analysis of accidents, causes and remedies by the safety and inspection committees, greater executive support, and consequently secures results.

The interest taken in this report, which is regularly posted on the bulletin boards, by the rank and file of the employees in the company which I represent is very gratifying. While all the men do not understand the actual method, they nevertheless believe that it is accurate, and they do understand the final comparative figures. Each department is very much concerned when its accident costs increase, especially the coal and water gas manufacturing subdivisions, so that professional departmental pride is stimulated, and real effective safety work is accomplished.

Use Printed Rules Wherever Possible

The operation of a gas works is a scientific process and much of the work must be performed in exact sequence and with great care. Consequently everything which can be reduced to rules should be printed and posted, and every effort must be made to see that the men who are operating the equipment fully understand what they are doing. In this connection a daily operating log sheet or bulletin is of great importance, as on it the superintendent or assistant in active charge can briefly discuss with his foreman the problems which are being daily encountered and by advice, admonition or instruction keep the plant operation, on which safety depends, at high efficiency. Such rules and their strict observance are of signal importance, for example, in the operation of water gas sets. In New York State there was a comparatively recent explosion of a water gas set which killed and maimed several employees, due, it is believed, to failure to follow the rules laid down for starting up the set. Rules should provide for a necessary check by the superintendent or other employee on work being done, either operation or repair to see that connections are properly made, the right valves correctly and fully operated, ventilation provided, masks or goggles used, etc., depending upon circumstances.

Engineering Matter

Accident prevention in gas manufacturing properties is largely a matter of engineering, and therefore the design of new work and additions deserves very careful consideration. Many of the factors relative to layout and types of equipment are matters of judgment which is often influenced in the right direction by observation of the work of others. It is thus advantageous to visit other gas manufacturing properties from time to time especially when new construction is contemplated.

One of the most serious gas works hazards is that due to poisoning from carbon monoxide, especially in water gas plants, in coal gas plants which operate gas producers, and in connection with fires in coal piles. To control this hazard good equipment, adequate ventilation and correct methods are of first importance. Many installations require a special power driven ventilating plant. In this connection one of the greatest risks is incurred through the contempt for gas poisoning which so many of the older gas works employees have. Some of these men have and are operating old-style equipment, have been comparatively frequently partially overcome by gas and pride themselves on their fancied immunity. This type of man will attempt to make repairs under conditions of serious danger, alone or without mask protection.

Use of Masks

Work on live gas apparatus can be safely accomplished by the use of suitable masks, and experience

has shown that the hose type mask is the one which provides a maximum amount of protection. These are on the market in two styles, one with simply a nose and mouth piece and the other with a complete face piece containing goggles. The latter affords the better protection, can be used in working on ammonia lines and is easier to wear. The company which I represent does not believe in the use of carbon monoxide filters for the reason that it is practically impossible to be certain of the percentage of carbon monoxide in the air and the strength of filtering properties of the mask. We feel that the situation is altogether too grave to submit our employees to the risk of asphyxiation and therefore rely on the hose-type mask only.

Special warning is necessary in connection with the use of the so-called army type of gas mask, as cases are on record where men have gone into closed tanks which had not been purged of benzol fumes, under the erroneous supposition that the mask afforded ample protection. The filter type of mask, no matter how efficient, is absolutely useless in an atmosphere containing less than 15 per cent of oxygen, as this amount of oxygen is necessary to support life. Some filter masks will remove strong concentrations of fumes and smoke, such as those from carbon tetrachloride and burning insulation, and when used in such cases in open rooms are valuable. The danger lies in the extension of the use of these masks in fields for which they are not fitted.

With reference to purging tanks it is not always safe to rely on steaming and washing, as the oil forms a coating on the inside of the tank which is not removed by the steam and water. This coating or film gives up fumes when the water is removed, necessitating in many cases the use of the hose-type mask.

Resuscitation

It has been established through the National Electric Light Association that the Schaefer prone-pressure method of resuscitation is without question the most satisfactory of all resuscitation methods for reviving persons who have been made unconscious from electric shock and drowning. The accident prevention committee of the American Gas Association has, within the past year, been instrumental in securing the appointment of a special commission of physiologists of national reputation in the United States to pass upon the matter of resuscitation from gas poisoning. The commission is now in session. Meanwhile it is the unanimous opinion of the members of the aforesaid committee that the prone-pressure method is much safer and more reliable than any other method of resuscitation in gas poisoning cases, and that it should be taught to every employee in the gas manufacturing and distributing department.

In connection with gas asphyxiation reliable medical authority now states that the time-honored practice of walking persons who have been overcome by gas should be discontinued. The recommended procedure is to first establish breathing by the prone-pressure method, and then provide oxygen, warmth and quiet.

The aforesaid commission in an advance report advises that in 20 to 30 per cent of the cases coming under its observation, the administration of a mixture of 92 per cent oxygen and 8 per cent carbon dioxide after breathing has been established stimulates natural breathing so that a large amount of oxygen is drawn into the lungs. The oxygen displaces the carbon monoxide which has been taken up by the blood, and the rapidity with which this is accomplished through the use of carbon dioxide, viz., 200 to 300 per cent increase in volume of respiration, saves life, reduces the period of prostration, secondary respiratory failure, and the possibility of subsequent nervous or other degeneration. Serious cases of asphyxiation should also have supplementary medical treatment and subsequent hospital care under the advice of the best medical talent available.

Fire Protection

Coming now to a consideration of fire protection in and around a gas works the first step isto secure adequate plant fire fighting equipment and organization, the character and amount of which will depend entirely upon the size, character and location of the plant to be protected. The adequacy of the city water supply and fire-fighting system with reference to gas works protection requires special attention, especially as many gas works properties are in close proximity to serious fire risks under outside ownership and control. These must be carefully analyzed and may often be minimized by co-operative effort.

The major fire-fighting equipment within the gas works is naturally suitable hydrant and hose protection. This may be supplemented with Foamite and steam systems for large oil storage as circumstances warrant. A sufficient number of carbon tetrachloride and soda ash extinguishers must be judiciously located, and adequate watchmen and fire-alarm systems kept up at high efficiency. With reference to fire extinguishers an added element of protection is secured by painting red bull's-eyes on the walls where the extiguishers hang, which make them more readily located in emergencies.

Regular Inspection Necessary

Fire prevention requires a regular inspection of all fire-fighting equipment, preferably quarterly, this inspection to be more than a perfunctory performance. All extinguishers must be very carefully gone over, checked up, reloaded and repaired. All hydrants and hose require examination.

Many gas works properties have oil filters in connection with high-speed pumps and these must be located so that if the oil should overflow due to fire in the building, it will be caught and carried away. There are usually collateral fire hazards such as coal storage, woodworking or other shops and sometimes rag-washing plants, etc., which have grown up as small side lines on regular gas works operation. These often introduce serious fire hazards which must be minimized by a very careful layout of fire-fighting equipment.

Fire hazards in connection with the storage of bituminous coal form a special problem, and when the expense is not prohibitive may be minimized by care in piling. In theory coal-storage piles must exclude

air and should be shallow, tightly packed and free from foreign material. Coal should not be broken up, piled in conical heaps which separate the sizes, placed in storage when wet or piled against hot pipes and furnace walls. All of these theoretical conditions are often very difficult or impossible to meet.

Temperature pipes for thermometers may well be inserted in coal piles but these must be kept sealed when not in use, and the coal packed closely around them. Fires can be discovered by temperature readings, by smoke and by the smell of the products of combustion. The latter which contains, especially in bunkers, and one man should never be permitted to work alone either in bunkers or on piles in which the coal is on fire.

How to Handle Coal-Pile Fire

When a coal pile is on fire the best way to handle it is to move the coal. If this cannot be done, the pile must be cooled with water which must be applied through a nozzle on the coal actually burning, not on the top of the pile. The burning coal forms a waterproof canopy of coke through which the water nozzle must be driven with a sledge. All of this work involves special risk of stumbling, tripping, burning, asphyxiation and other hazards, aggravated by the excitement of the occasion.

In connection with benzol the tanks must necessarily be sequestered and either placed underground, in open pits or in locations as far away from the buildings and gas holders as possible. Smoking is to be absolutely prohibited in all parts of the gas works buildings and property.

Electrical hazards are often numerous in connection with wiring, motors, transformers, lights, switches, etc.

Fire Drills

In plants of sufficient size a fire department and fire drills are essential, but for the small or average plant it is sufficient to familiarize all of the principal employees with the location of the fire hydrants, hose and other fire-fighting equipment, and make it a part of the safety inspection to check up this equipment for adequacy and condition. The fire hazards, fire prevention and fire fighting system should be discussed from time to time in departmental meetings.

In connection with fire and accident hazards it seems wise to again mention certain risks of special importance which others have considered. The danger from explosive mixtures is always present, particularly that incurred from leaking stuffing boxes on gas booster pumps; in starting water gas machines; in connection with cleaning out scrubbers, and in the recovery of ammonia. Stuffing boxes must be carefully inspected, water gas machines properly started, scrubbers carefully steamed out and ammonia equipment kept in first-class condition. Vapor-proof lights, protected electric switches and ample ventilation are always necessary.

Tar in pits and trenches will, when ignited, burn with great intensity much like gasoline. Sand should be placed in pits to absorb the tar and should be renewed when necessary. Oil will collect on top of the water in holder cups, and has been ignited by hot rivets used on near-by repair work. Such oil should be removed and rivet jobs screened when necessary.

Relief holders have been collapsed due to operation of exhauster pumps after the holders have been emptied. This can be prevented by an electrically controlled cut-off valve in steam line to exhauster which should be arranged to operate at some predetermined low position of the holder on a broken rather than a closed circuit to provide for operation in case of failure of electric supply.

Hot coke has been responsible for many very serious burns, especially when workmen have allowed their clothing to become saturated with oil and tar. Coke-handling equipment should be adequate and men should be required to wear suitable clothing.

A Drowning Hazard

Water will frequently collect in unused pits and constitute a drowning hazard. When oil collects on the surface of the water in such pits, it constitutes a serious fire hazard. Such pits should be kept clean by draining or pumping.

Accidents which not only cause injury to employees but which result in very serious shutdowns are continually being avoided in modern gas plants through the ability of a superior type of master mechanic who inspects the entire equipment regularly for wear, defects, guarding, painting, order, sanitation and neatness. Narrow passageways and semi-darkened places where there is smoke or steam or where there are building columns or other obstructions to be avoided require special attention to prevent accidents. In such places additional lighting and the use of white paint is very helpful.

The prevention of accidents is to a large extent fostered by clean and sanitary conditions, suitable washrooms, adequate light, ventilation, etc. Men react favorably to that which is conducive to health and comfort.

A Medical Examination

It is becoming general practice to have all new employees medically examined before they report for work, to eliminate the physically unfit, not only those applicants who have pulmonary or other diseases which render them susceptible to gas fumes, dust or heat, but hernia, flatfoot and other disabilities which lead to accident and sickness in the purely mechanical operations of the plants.

In connection with fire, explosion and accident hazards brief mention should be made of the collateral insurance situation. Many fire and compensation insurance organizations, both stock and mutual, allow substantial premium credits for safety organizations, safeguards, plant housekeeping, reduction in accident cost, etc., which are all well worth striving for on their own merits, without regard for the prime motive of accident and fire-prevention work, i. e., loss of life, limb and property.

The fire insurance committee of the American Gas Association has very recently gathered statistics on fire insurance in gas properties which have had the effect of causing the adoption of new schedules by several underwriting associations in many of the States. These new schedules, which will probably be

generally adopted, provide for an average rate reduction of 25 per cent and it is believed that further substantial reductions will be made in the reasonably near future. Among other things this committee is urging explosion insurance, and better self-inspection of properties by individual member companies.

The insurance underwriting associations and companies quite generally maintain engineering inspection departments, the services of which can be secured for expenses and a nominal fee, to inspect and advise as to fire and accident hazards.

It is of considerable interest in this connection to note that there is some agitation among gas companies in the United States toward the formation of a mutual fire insurance organization.

Through the courtesy of the fire insurance committee a new insurance scheduel for coal, water and oil gas plants, a self-inspection form and explosion clause for fire insurance policies are attached as part of an appendix hereto.

This appendix also contains copies of forms in use by the company which I represent, one for the use of safety inspection committees and the other being the monthly cost analysis previously referred to.

In conclusion, this paper may be summed up as follows:

Adequate information is now available, and may be intelligently used to control the accident situation in gas manufacturing properties by:

1. The interest and support of accident prevention by the management and the operating executives.
2. An adequate, efficient, practical accident prevention system.
3. Good equipment and apparatus, efficiently kept up, and adequately guarded.
4. Suitable safety devices, first-aid appliances and methods.
5. The highest type of medical care.
6. Correct operating system including rules and instructions.
7. Requisite cleanliness, sanitation, ventilation, space, order and neatness.
8. That "esprit de corps" existing among the right type of employees, who are justly treated, adequately paid, and are sold on the fundamental equity on which the entire business of the company is conducted.

The time will probably never come when there will not be any accidents or fires in gas manufacturing properties, but they will certainly be ultimately reduced to a minimum which is reasonably consistent with the accident prevention knowledge of the times. To this end, therefore, we must spread not only this knowledge, but the spirit of personal responsibility in this connection in all walks of life.

The old adage has it, "Where there is a will there's a way," and so in accident prevention, as in most of the things in life, our success is largely proportional to our determination.

FIRE-PREVENTION SELF-INSPECTION BLANK—AMERICAN GAS ASSOCIATION

Fire Cause

Housekeeping—

Did you find any refuse or sweepings lying about? .....

Did you look under benches, behind steam pipes, in closets, etc? .....

Were all such places free from combustible material? .....

Did you inspect clothes lockers? .....

Were all clothes hanging in lockers in orderly condition? .....

Were waste cans in proper locations and in good repair? .....

Was any oily waste found outside waste cans? .....

Any locations needing waste cans without them? ....

Any accumulation of oily or greasy material found? .....

Was works yard clean, free from unnecessary waste or rubbish, dead grass, leaves? .....

What action taken on defects noted above? .....

Heat Hazards—

Did you find any woodwork or other combustible material too near smokestacks, flues, furnaces, stoves, boilers, steam traps, etc? .....

Is hot ashes properly handled so as not to come in contact with combustible material? .....

Any soldering furnaces used without protection to surrounding material? .....

Gas heating appliances should be connected by rigid piping, not by flexible tubing. Is this being done? .....

Where flexible tubing must be used, shut-off valve should be provided at fixture, not at appliance, and safety, not slip, end provided. Is this being done? .....

What action taken on defects noted above? .....

Lighting and Electric Hazards—

Lighting in purifier and exhauster sections, oil houses, garages, and all other locations where gas or volatile oils are stored should be by electric light only, wires in conduit, keyless sockets, vapor-proof globes, outside cut-outs, switches outside building. Are we maintaining this standard? .....

Where are we substandard? .....

Why? .....

Find any unguarded gas or electric lights which might touch or expose combustible material? .....

Find any broken fixtures or wires loosened from supports? .....

See any flexible cords looped over nails or other metallic substances? .....

Were all drop lights properly supported from rosettes and of reinforced cord instead of twisted pair cords? .....

Any electric light span too long or poorly supported? .....

Any wiring in contact with metal or other wire without bushing? .....

All fuses in good condition? .....

Any fuses replaced by wire or too large? .....

All panel boards, switch and fuse cabinets clean and in good order? .....

Motors clean internally and externally? .....

Any dead wiring or unused gas outlets that can be removed? .....

What action taken on above defects? .....

(*Continued on page* 235.)

As the Journal Views It

New York Adopts B.t.u. Standard

The establishment of the B.t.u. standard in place of the antiquated candle-power requirement, which will go into effect in New York City on Oct. 1, marks the beginning of an epoch in the history of the gas industry, even though this change was accompanied by a reduction in price. However, the fact that New York has followed practically every other large city in the United States in this move is of vast importance to the gas industry.

An important feature of the order making the change is the fact that the Public Service Commission of New York State recognizes the rights of a gas company to establish a wholesale rate for large industrial users of gas where it is warranted. These rates grade down to ninety-five cents a thousand where a large quantity of gas is consumed, and should mean a tremendous spurt in demand for gas as industrial fuel.

With only one or two exceptions, the newspapers of New York welcomed the change from the candle-power standard and were of the opinion that in the long run the consumer will benefit. However, there were some newspapers that followed the lead of Mayor Hylan in denouncing the proposed change, even though it was accompanied by a ten-cent reduction in price. Gasmen generally will understand the reason for this kind of opposition and will realize that it is an effort to keep the public utility question in politics.

The statement by R. A. Carter, vice-president of the Consolidated Gas Company of New York, which is published in another part of this issue, sums up the situation splendidly when it says:

"The gas rates fixed by the order of the Public Service Commission for the Consolidated system companies are not adequate under present conditions, or any conditions which can now be regarded as reasonably in prospect. They do not allow an adequate rate of return upon even the indisputable amount of the actual investment in our gas properties as found by the Commission.

"The Commission has seen fit to base a present drastic reduction in rates upon a hoped-for but uncertain improvement in conditions and decrease in fuel costs at some time in the future. An acceptance of the orders, if filed, would be coupled with a full reservation of all our rights should conditions become more serious, and the rates would be given a fair trial in good faith in the hope that they would soon become adequate. In other words, the restoration of a higher rate would not be sought unless conditions urgently required it as a matter of justice to our investors."

Tfiis takes in the financial aspect of the situation, which will be watched with a great deal of interest by the entire industry.

Public in Dark Regarding Coal Settlement

With both the bituminous and anthracite coal miners returning to the mines, the news of the settlement of the coal strike has been spread broadcast. In many cases the general impression has been left with the public that the coal shortage will not be acute this winter. That this is erroneous every gasman can testify.

New York State has handled the coal situation splendidly. A few weeks ago, when alarm was being widely felt, Governor Miller called a special session of the Legislature, which passed laws which he proposed giving full authority to a fuel administrator. In fact, the greatest authority ever given to an individual by law has been given to William G. Woodin, who has just been appointed to that important position. Mr. Woodin, a business man of wide experience, has gone about his duties in a common-sense way, and not only New York State but the entire nation should benefit as a result of his activities. It is the hope of the Fuel Administration of New York State that by proper rationing of coal an acute shortage will be avoided, although it is readily admitted there will be no surplus.

Other States, of course, have fuel administrations, but we doubt that they have as great authority as New York has bestowed upon its dictator.

But even with careful rationing the demand on gas companies is going to be tremendous, and it is absolutely essential that gas companies should in every way take full steps to care for their consumers so far as possible. The advice broadcast by the American Gas Association, that of conservation, should be backed up to the fullest extent by the work of the local companies. If this is done, out of the situation will come great good for the industry as a whole. We believe that there will be sufficient coal available for gas companies to care for the demands of all their consumers.

Installing Tar Extractor

The Consolidated Gas, Electric Light & Power Company, of Baltimore, Md., has placed order with the U. G. I. Contracting Company, of Philadelphia, Pa., for two U. G. I. tar extractors, each having a capacity of 6,000,000 cu. ft. per day. The latter company has also received orders to install two similar tar extractors at the Langsdale Avenue plant of the Citizens Gas Company, of Indianapolis, Ind., and one tar extractor of 4,5000,000 cu. ft. capacity at its Prospect Street plant.

Sulphiding of Metals in Gas Kilns

Problems Developing from Industrial Uses

By B. B. SAUL, Chemist, Montreal Light, Heat & Power Consolidated

The industrial uses of gas-fired kilns has brought before us a few problems worthy of mention before the gas association. It is, namely, a secondary chemical reaction occurring between the impurities in the flue gases and the articles in kilns during heat treatment, whereby a discoloration takes place in the metal painted surface or an opalescent state brought about with lenses. To illustrate, the history of three cases will be cited, and it will be noted that in each case the remedy is similar.

Case I—Silver Deposit Decorations on Glass

Glass and porcelain ware, such as tumblers, bowls, coffee and tea sets, when furnished with galvanoplastic decorations in copper, silver or gold, produce beautiful effects. Before metalization, however, some sort of basic support must be obtained for the high relief produced, in order that the metal part might not be detached during cleansing or by continued wear.

The process consists in saturating the chloride of silver, the oxide of silver and anhydrous sodium carbonate with pure turpentine until the consistency of a paint is produced. Beautiful continuous designs, such as arabasques, flowers, monograms, etc., are sketched with a fine brush on the glassware, and the painted wares are allowed to air dry overnight in order to evaporate most of the turpentine. They are then placed in a muffle kiln, the temperature is gradually raised until a dark red heat is obtained, fusing the metal paint with the low melting point glass, thus bringing about a more intimate and stronger bond between the paint and the glass. After cooling, the glass or porcelain ware is suspended by a silver wire in a silver cyanide bath and is electroplated, the metal paint in the glass acting as the cathode, while a suspended bar of pure metallic silver is the anode.

It is during the process of fusion that at the surface of contact between the paint and the glass a decidedly yellow coloration may occur in place of the natural silvery-white appearance. With non-transparent ware, such as teapots, this discoloration, if it exists, is not observable, but with glass, this yellow tint detracts from the artistic value of the merchandise. The manufacturer then has the choice of finishing the article and disposing of it as a second, or else accept his loss right here and go no further with it. At times the amount of rejected goods was alarming, creating a serious state in this little business. A satisfactory solution was imperative if gas was to be continued in use by this firm.

It was learned that this difficulty was periodic in its appearance, and it was most pronounced in calm and humid weather. It was decided that the flue gases had at least something to do with this yellow coloration. Apparently, the sulphur dioxide produced by combustion of the various sulphur impurities in the gas was absorbed by the alkaline paint which, on account of the reducing atmosphere, was partially converted into sulphur, and the latter reacting with the potash in the glass produced what is known as liver of sulphur. The composition of this liver-colored mass is variable and depends on the proportions in which the bodies have been mixed and the temperature of fusion. Obviously, then, the flue gases must be kept away from the interior of the muffle if discoloration was to be avoided. It was difficult to keep the door of the kiln sealed because the remainder of the paint vehicle had to be driven off and an outlet for its escape provided. Also, it was the customary way for the operator to observe the progress of fusion. A vent was constructed connecting the interior of the kiln with the flue, thus acting as an outlet for the turpentine vapors, and thereby allowing the door of the kiln to be kept sealed during the beginning of the operation. By extending the height of the chimney, sufficient draft was obtained to conduct away the flue gases, so that the occasional opening of the kiln door did no harm. Since these minor changes were made no complaints have come from this source, but the cleaning of the chimney may have helped also.

It is interesting to note that similar difficulty has been experienced elsewhere.

1. L. Springer speaks of a yellow coloration exactly similar as described above. He claims that this yellow appearance is a function of the temperature and quotes experiments showing that the yellow tint is intensified with augmentation of the kiln temperature. Burning should not be affected above a dark red heat, and the glass should be in the muffle as short a time as possible.

2. Later he found that by using the borate of lead for a flux in place of the anhydrous sodium carbonate this yellow coloration is less likely to occur.

Case II—Manufacture of Bifocal Lenses

In making a bifocal lens, the so-called "Krypton" lens, a fusion is brought about between a disc of flint glass and crown glass. It was found that after fusion and grinding the flint glass was slightly opalescent. This entailed quite a loss for, while the original lens was of little value, the labor involved in grinding was considerable, and this opalescent state, probably sulphiding of the lead in the glass, is not shown until after this grinding. Here, too, the solution consisted of excluding all flue gases from the interior of the muffle. But this object was more difficult to attain. Here the burning gases had a higher velocity than in Case I, in order to produce a higher temperature, so that some of the flue gases found their way through the pores of the muffle. At that

time the inner muffle was constructed of carborundum and it was thought that a graphite interior would produce better results. A graphite muffle improved matters, but it was not until a ni-chrome steel muffle was made that entirely satisfactory results were obtained. Recently electrically heated muffles have been installed because of the greater ease of temperature control.

Accident Fire Prevention

(*Continued from page 232.*)

Matches and Smoking—

None but safety matches are permitted about this plant. Did you find any violation of this rule? ..... Where? .....

What action taken? .....

Smoking is strictly prohibited in all sections of this plant where an explosion of gas might possibly occur, also in garage, oil houses, etc. Did you find any violation of this rule?.....

Where? .....

What action taken? .....

Are "No Smoking" signs in good condition and properly posted in all sections of the plant?.....

Where are these signs posted?.....

Power and Lubrication—

Were any bearings found improperly oiled or dirty? .....

If so, where? .....

Did you find machinery, belts or shaftings in any part of plant in bad condition?.....

Is there any danger of sparks being generated from friction of belts or from any other source in manufacturing section where ignition of gas might occur? .....

If so, where? .....

What action taken on defects noted?.....

Oils, Paint and Other Hazardous Material—

All oils, paint, etc., should be stored in separate oil room, completely cut off from other buildings, and a supply sufficient only for daily needs be kept in buildings where they are being used. Is this being done? .....

Are metal pans with turned-up edges provided for oil drippings? .....

Are elevator, flywheel and garage pits clean and free from oil? .....

Gasoline vapor is highly inflammable, and should be stored underground. Is this being done?.....

Pentaine should also be stored outside, preferably in pit. Is this being done?.....

Many supplies used about gas plants are subject to spontaneous combustion or give off gases liable to explode, such as burlap sacks, oil skin suits, lampblack, bronzing powder (spontaneous combustion hazard), benzine, naphtha, liquid veneer, banana oil, stove polish, metal polish, gasoline torches, lamp lacquer, shellac, alcohol and turpentine. Are all excess supplies kept in oil house and away from other supplies?.....

Are local supplies properly stored in metal boxes where possible, all containers properly stoppered, and is the supply removed to oil house or outside window box at night?.....

Where are these rules being violated?.....

What action taken? .....

Fire Spread

Fire Doors and Other Fire Stops—

Are any fire doors wedged open, obstructed by stock or otherwise rendered unserviceable?.....

Are fusible links in proper place to fuse in case of fire? .....

Are any doors out of repair or not working freely? .....

Can you suggest any place where a fire door might be installed to advantage?.....

Are traps or doors on openings through floors in order? .....

Are all fire doors and shutters closed at night?.....

Does watchman or night force close all fire doors behind them? .....

Did you notice any broken window panes, plastering, partitions or flooring that might tend to spread a fire? .....

Where? .....

Are all openings exposed to sparks properly screened? .....

Notice any openings between buildings, floors or sections that might be permanently closed, or where doors or traps might be put to reduce the areas subject to a fire?.....

Any concealed spaces that would tend to spread fire that could be removed?.....

Where? .....

What action taken on defects noted?.....

Maintenance—

Does watchman visit all parts of plant?.....

Were watch clock records checked and found satisfactory? .....

Was fire signal system tested and found to work properly? .....

Are fire pumps tested regularly through relief valve? .....

How often? .....

(Should be tested wekly)

"In Case of Fire" cards should be posted under glass in conspicuous places about plant, giving telephone number of fire company, location nearest public fire alarm box, and any other information desirable. Is this being done?.....

No matter what the size of plant, a fire brigade should be organized and every man instructed as to duties at time of fire. Is this being done? .....

How often are drills held?.....

Any workman found violating safety rules that could tend to cause explosion of gas or cause any other damage or injury to himself?.....

What action taken on above defects?.....

Special Hazards—

The special hazards of our business are the explosion of gas and possible oil fires.

FIRE INSURANCE RATE REDUCTION

Gentlemen

The new gas plant schedule contemplates the in-

clusion of the gas explosion hazard as well as the ordinary fire hazard, and it is understood that in all underwriting jurisdictions where it is practicable to do so it will be included without additional charge. Gas companies therefore should see that the form attached to their policies is so written as to include this hazard, as the standard fire policy does not cover explosion losses.

It is suggested that if there is no explosion clause now in your form, one similar to the following be included:

"In construing the terms and conditions of this policy, the ignition of gas or vapor in or about the premises described herein shall be regarded as 'Fire,' and the loss resulting therefrom shall be adjusted and paid in the same manner as if otherwise occasioned; and all conditions in this policy relating to the generating of gas and the storage and use of naphtha and fuel oil and other inflammable explosive materials are hereby waived."

This form is being used in some underwriting jurisdictions, but it is submitted merely as an example of what the clause should be. Have your insurance agent consult the inspection bureau in charge as to what wording will be acceptable, only be sure the desired coverage is obtained, as it is valuable.

Very truly yours,

P. A. WILSON, Chairman,
Committee on Fire Insurance Rates.

ROCHESTER GAS & ELECTRIC CORPORATION

Safety Committee Inspection Report

Inspection of..... Date.....192..

Instruction to Inspection Committee

Examine everything listed for condition and adequacy. Note carefully all possibilities of accident. Underlying subject requiring attention, and give explanation in blank space. Send this report to foreman of property inspected.

Inspection made and report submitted by the following committee:

....
....
.....Chairman

Instructions to Foremen

Mark O. K. or N. G. with your initials after each recommendation and send your report to your superintendent.

Instructions to Superintendent

Mark O. K. or N. G. with your initials after each recommendaton and send report to secretary of general safety committee.

Buildings

Roofs, walls, floors, ceilings, stairways, windows, lighting, toilets, washrooms, passageways, heating apparatus, ventilation, fire protection, elevators, nail hazards, ice and snow, steam pipes, wiring, toe boards, wire mesh protection, railings, general order and neatness.

.....

Gas Works and Holder

Coal and coke pile, coal and coke handling apparatus, retorts, producers, crushers, coke bins, driveways, purifiers, exhausters, meters, auxiliary apparatus, fire-fighting equipment, holders, boilers, pumps.

.....

Underground Construction, Gas and Electric

Bracing of trenches, piling paving stones, red flags and lanterns, guards, gas helmets, tools and equipment, pavements.

.....

Electric Distribution, Subway

Manhole covers, manholes, cables, absence of cable tags, transformers and fuses, sewer connections, junction boxes, wagons and equipments, rubber gloves, pavements.

.....

Electric Distribution, Overhead

Poles and towers, cross arms and braces, guy wires and anchors, pins and insulators, stops, lightning arresters, wires, switches and fuses, transformers, wall brackets, cables, lamp hangers and ropes, wagons and equipment, rubber gloves, line shields, safety belts, insulated pliers, screwdrivers.

.....

Electric Machinery

Generators, governors, motors, transformers, motor generators, rotary convertors, switchboard and equipment (rubber gloves, leather gloves, fuse pullers, switch sticks), frequency changers, oil switches, regulators, lightning arresters, disconnecting switches, floor insulation, cables, arc transformers, storage batteries, oil storage equipment.

.....

Steam Machinery

Boilers, stokers, piping, valves, economizers, ash disposal machinery, coal conveyors, coal bunkers, water purifying plant, condensers, pumps, fans, air washer and compressor, engines, turbines.

.....

Hydraulic Machinery

Dams, head gates, spillway, forebay, racks, penstocks, valves, water wheels, draft tubes, tail race syphon.

.....

Miscellaneous

Cranes and hoists, drill presses, lathes, emery wheels and grindstones, goggles, stumbling hazards, saw guards, gear guards, belt guards, unsafe methods, pipe threader, elevators, all hand tools (broken handles, mushroomed heads, ladders, rungs and shoes), hoisting equipment, gearing belts and rope drive, driveways, transportation wagons and devices, gasoline and oil storage, loading of wagons, escaping gas, scaffolds, rubbish, temporary wiring, danger signs, piled material, storage of material, first aid supplies, storage of inflammable materials.

.....

General—Not Listed

.....

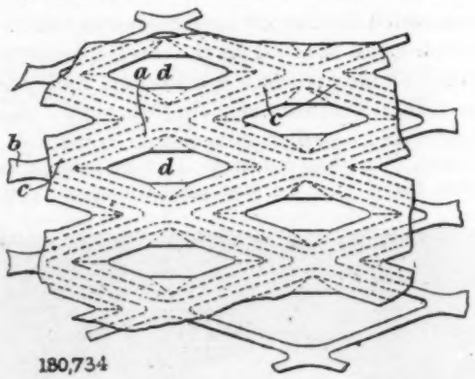
Developments in Gas Technology

Important Information Gathered from All Parts of the World

By ISMAR GINSBERG, B.Sc., Chem. Eng., Associate Editor

Grids for Gas Purifiers

The usual forms of grids for gas purifiers or scrubbers, which are made of wooden bars, have been found to deteriorate rapidly due to exposure to moisture and high temperatures, to the expansion of the purifying material which they support, and to damage in removing this material. In this invention (see British Patent No. 180,734) these difficulties are overcome by the use of a grid or perforated slab of concrete which is reinforced with expanded metal. From the illustration it may be



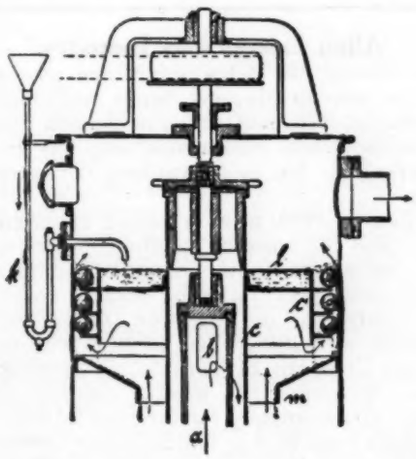
seen that the concrete is molded over the expanded metal framework *b*, *c* to form a lattice structure. The gas openings *d* are preferably of smaller dimensions at the top than at the bottom, and the adjacent bars are shaped correspondingly. The side frame of the grid may be formed of one piece with the rest of the structure, or it may be made of wood. Cross-bars may also be used to stiffen the grid. The grid may also be formed of bars of concrete with reinforcing metal bars which are looped at their ends around the surrounding bars of the frame. In another modification the grid may be provided with wooden bearing members, or it may be formed of parallel reinforced concrete bars.

Preheating Arrangement for Gas Generation

The group of retorts is arranged in the usual manner. They are then connected with a heat-accumulating arrangement which consists of two air and two gas heaters. In this manner there are always three separate heating spaces connected with each half of the retort group. Two of these spaces are always connected with the one heat accumulator, while the other, which lies inbetween, is connected with the other heat accumulator. For further details see German Patent No. 327,161.

Gas Washer

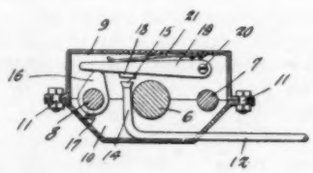
The gas washer which is seen in the accompanying illustration is patented in German Patent No. 335,776. The gas, which is under high pressure, enters through the fixed tube and passes through the opening *b* into the rotating tube *c*, which is fixed fast with the circular housing *c'*. The gas is forced down through the tube *c*, which dips into water, and then through the water itself. The rising current of gas enters under the cover of the circular housing and is forced behind the sprayed balls at the edges of the circular housing, as is indicated by the arrow in the diagram. The housing, which is driven by means of a belt and pulley, is suspended from a bearing which is fixed to the stationary tube *a*. The



water, which is allowed to flow into the apparatus through the siphon *k*, runs over the edge of the bowl *l*. The rotation of the apparatus flings this water against the sides of the apparatus, so that it flows over the balls located at the edges. It then runs down the apparaus and flows off through the funnel *m*.

Gas-Saving Appliance

The gas-saving appliance seen in the accompanying figure, which is patented in United States Patent No. 1,403,517, consists of a sectional casing into which a supply pipe extends. The end of this pipe is flared. An arm 19 is supported pivotally at 20 within the casing.



The spring 21 urges this arm toward the flared opening of the pipe 15. The arm is connected with a valve. The pressure of the gas against the arm causes the valve to act—that is, either to open or close—so that the flow of gas is regulated and economy in its consumption is secured. The cam 16 makes contact with the arm 19 and tends to keep it away from the flared end of the pipe.

Coking of Tar Pitch

The coking of tar pitch was undertaken during the war, due to the shortage of materials for the manufacture of electrodes. Hard coal pitch was mostly used for this purpose, but lignite tar pitch and petroleum pitch were also employed to some extent. The coking is carried out large cast-iron retorts with removable covers, connected to coolers and collecting apparatus. The temperature of the coking is 700 to 750 deg. Cent. Each retort holds 1 to 2.5 tons of pitch. The coking of this charge, including charging, cooling and discharging, takes from twenty-four to thirty-six hours. The distillation is carried out under a good vacuum. The first product of the distillation is a thick brown oil (specific gravity 1.15 to 1.17) which congeals on cooling. The next distillate is a reddish brown resin. At the same time there is a voluminous evolution of gas. The coke formation extends over a long period of heating to incandescence. At the end of the coking operation superheated steam is introduced into the retort to drive off the last traces of oily and resinous vapors. The coke produced is quite irregular in appearance and properties. The best coke is located around the outer edges of the charge. The product is light gray in color and much more porous than metallurgical coke. The coke is very light hygroscopic and floats on the surface of water. The yield in coke amounts to from 50 to 60 per cent, that of oil 30 to 40 per cent, and that of resin 4 to 6 per cent. The oil is filtered and can be used as a fuel, or else it may be converted into tar-fat oils. When lignite coal-tar pitch is distilled, a comparatively large yield of paraffine is obtained; and when petroleum pitch is processed, different mineral oils are produced. For further details see the original German article in *Jour. Gasbel*, Vol. 62, 510-3.

Allen Leaves Gas Industry

When George W. Allen leaves the gas industry shortly, to take up his new duties with one of the largest manufacturers of shoes in Canada, there will have gone from this field a man who has devoted a large part of his life to forwarding the interests of this field.

Mr. Allen in 1900, after a varied experience, entered business for himself, handling electrical goods and contracting for lighting installations of various kinds including gas. Later he became an electrical and gas contractor in Brantford, Ont., continuing this business until 1909, when he went with the Consumers Gas Company of Toronto, as lighting representative. Mr. Allen has worked steadily with the Consumers Gas Company for the past thirteen years, during which time he has handled many branches of the service.

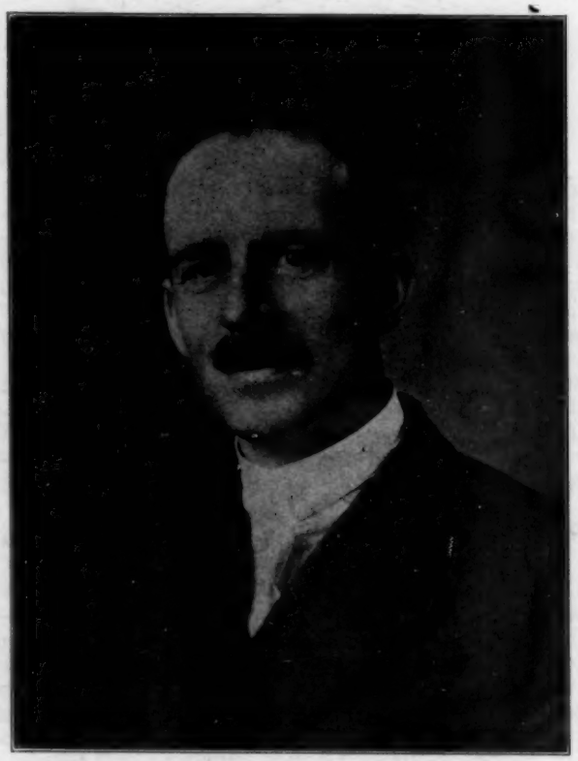
To Mr. Allen belongs the unique distinction of having sold the first gas range handled by the company after its establishment of a new-business department. It is interesting to note that this branch of the Consumers Gas Company has now developed until its annual turnover is very large.

In 1910 Mr. Allen was made advertising manager of the company and he has retained that position until now. In addition to his other activities Mr. Allen developed the personnel administration department, his work including the supervision of employment, promotion, transfer and wage regulation of employees. The company lunchroom, restroom and general welfare work, as well as the library and other educational work also came under his care.

The first public lectures ever given in Canada in travelogue form, illustrating the rise of the gas industry were given by Mr. Allen. Over 20,000 persons have heard Mr. Allen give the talks on various gas subjects. We believe the Consumers Gas Company of Toronto has now in its possession through the work of Mr. Allen the largest collection of educational lantern slides possessed by any industrial firm or utility.

In addition to all of his other pioneering work, Mr. Allen was the first gasman to give illustrated talks on "One Hundred Ways to Save Gas in the Home."

In 1904 Mr. Allen established the first arc-light maintenance system in Canada, a branch of his own business which he carried on for several years. Mr. Allen took great interest in the development of the National Commercial Gas Association, and was active on several committees, being the only Canadian member of the board of educational control of that association. In this connection it is interesting to note that for a time he was educational director of the Consumers Gas Company and at one time had an enrollment of over 200 students of the gas company, the largest enrollment from any single company on the continent.



George W. Allen

Mr. Allen has had wide experience as an advertis-

ing man and spent several years in the study of sales problems.

In 1920 his interest in industrial relations subjects was such that he was elected secretary-treasurer of the Industrial Relations Association of Canada. Mr. Allen has rendered great service to the gas industry in his capacity of secretary-treasurer of the Canadian Gas Association, to which position he was appointed in 1917. For the past three years, he has been editor of the *Inter-Colonial Gas Journal of Canada.* Mr. Allen was born Oct. 19, 1879, in Toronto. He received his early education in the public schools of that city.

"Hardened Diaphragms and Gummy Meter Deposits"

A Report on Work Accomplished

By B. B. SAUL and E. J. TURLEY, Montreal Light, Heat & Power Company

This paper consists of a survey of the more important works published on this subject and a presentation of the experience obtained with the meter diaphragms and such facts determined in the laboratories of the Montreal Light, Heat & Power Company.

It is only within comparatively recent time, since the substitution of the B.t.u. standard in place of the candlepower standard, that the deposits found in meters have assumed the status of importance. It is significant that just about this time lime purification was deserted for the more commercially efficient system of purification by employing hydrated iron oxide. It is generally conceded that these economic improvements have exerted their influence in bringing about a condition which we have to-day. The heating standard in place of the candlepower standard was one of the direct causes for high temperature carbonization, which in turn means a higher yield of corrosive substances in the gas, while the absence of lime interferes with the removal of this destructive influence. However, to just what extent this relationship holds is not definitely known. The subject itself is too complicated, and the number of investigations made along this line are too scanty to enable one to draw a definite conclusion.

The results, however, are too well known. After ten to fifteen years' operation, a thick, dark brown, syrup-like substance is deposited in the meter, which, on account of its high viscosity, interferes with the internal mechanism and therefore with the meter performance. At the same time the leather diaphragm progressively deteriorates, often becoming hard and brittle. This brittleness exists at the bottom of the diaphragm, although at times it extends completely around the leather strip. Usually the hardening is most marked where the leather is in contact with metal casing, where a certain amount of mechanical wear takes place during the expansion and contraction of the diaphragm. Unfortunately, the meter deposit being at the bottom of the meter, where the leather is most likely to be deteriorated, the additional strain of overcoming this viscous fluid leads to a complete breakdown of the diaphragm or else failure of meter operation occurs owing to the adhesive nature of the meter deposit.

Some of the Theories

The theories for the hardening of leathers in meter diaphragms are many. The more reasonable ones are:

1. Rotting action caused by the rancidity of the neat's-foot oil. The meter deposited analyzed 2.8 per cent free fatty acid.
2. Mechanical wear: Rubbing and scraping action of the leather against the meter casing during meter operation.
3. Extraction of the fatty substance of the leather by the hydrocarbons of the gas, especially where the twisting and turning action of the leather takes place during the expansion and the contraction phases of the measuring cycle. This extraction proceeds until the fatty substances are completely exhausted, leaving behind the hard and perished leather and a deposit of fatty substances in the bottom of meter.
4. Formation of the tannate of iron. This theory will be discussed later.

The first serious official attempt made in attacking the problem of meter deposits was undertaken by the Joint Committee of the Institute of Gas Engineers and the Society of British Gas Industries. In 1916 [1] a preliminary report was submitted, in which they pointed out that the decaying of the leather is brought about by the acid used for tanning and also by the soldering flux employed, while NH_3, HCN and other constituents of the gas exert secondary parts in bringing about the destruction of the leather. They also put forward the claim that the gas had a solvent action on the leather, although this was later refuted by M. C. Lamb, who attributes the presence of leather in the meter deposit due to mechanical wear. Many samples of meter deposits were analyzed. The following constituents were generally present:

Volatile Matter—(1) Liquid hydrocarbons (up to 200 oc.), 17 to 33 per cent by volume; (2) naphthalene, 5.6 to 9.3 grams/100 c.c.

Non-Volatile Matter—(1) Fatty oils; (2) collagen (a nitrogenous decomposition product of leather); (3) ash (iron, tin, zinc); (4) ammonium salts, graphite.

Lamb's Investigation

A most thorough investigation on "The Deterioration of Leather Used in Gas Meters" [2] was made by M. C.

[1] J. G. Lighting, 1916, 134, 586-591.
[2] J. S. C. I., 1916, 35, p. 989

Lamb for the South Metropolitan Gas Company, an investigation covering from 1913 to 1916. He emphasized the gradually increasing tendency on the part of gas meters to require repairing on account of the partial or complete breakdown of the diaphragm mechanism. He found that while the leather was sound toward the center of the strip, it was usually hard and perished where it came in direct contact with either the metallic band fastening the leather to the diaphragm or with the diaphragm itself. Here the leather was hard and discolored. In a few cases a narrow strip of leather had been placed in direct contact with the metal diaphragm and under the meter leather, to act as a cushion when the meter leather was fixed by hemp cord or string; this strip of leather, which was protected from the direct contact with the gas, had, in every case examined by him, become completely perished. Subsequently, analytical investigations showed that at the parts mentioned the deterioration of the leather had been caused by conversion of the tannin in the leather to the tannate of iron, making the leather hard and brittle. The iron content of these parts of the diaphragm was sometimes as high as 0.3 per cent Fe.

The general method employed for connecting the diaphragm was either by (1) means of a steel band, protected by linen tape or leather, or (2) attachment was made with several coils of hemp cord drawn tightly round the edge of the metal diaphragm, a cushion being made of a thin strip of leather to produce a tight joint.

The Use of Adhesives

Various adhesives, such as resin and tallow, buck tallow, paraffine wax, etc., were used to embed the leather after tightening the band, in order to seal up any small crevices. The author points out the danger of using such material on account of the free acid liberated during rancidity. If an embedding agent must be used, paraffine wax or pure buck tallow are least harmful.

The dressing oil used was a mixture of almond and graphite, or the cheaper substitute peach kernel or apricot kernel oil is quite satisfactory. No sulphonated oil should be employed. Graphite is advisable as a filling agent to close up the interstices of the fibers.

A large number of tests were then carried out by the author in order to determine the effect that the meter deposit has on leather. He found that strips of leather which had been immersed in meter deposit for six months had apparently not suffered any deterioration. However, by binding the strips of leather around pieces of metallic band used for attaching the meter leather to the diaphragm, and immersing them in the deposits obtained from the meter, the leather in every case became deteriorated and brittle, the deteriorations being especially marked at those parts in contact with the metal.

He next determined the effect of various tanned leather under conditions obtained with meter diaphragms. He found that vegetable tanned leather was most liable to deterioration. Mineral tannage was more satisfactory. In his report to the South Metropolitan Gas Company the following recommendations were made:

1. Abolition of the steel band and the substitution of an aluminum band for attachment. Embedding agent to be abandoned.

2. Semi-chrome East Indian tanned leather to be used for large-size meters. For smaller meters, real chrome leather made from lambskin was more satisfactory.

These recommendations were adopted provisionally by the South Metropolitan Gas Company.

The Brown Explanation

The latest and most novel explanation for the origin of the gummy deposit in meters was advanced by R. L. Brown,[3] U. S. Bureau of Mines, chairman of the gas pipe and meter deposits committee, A. G. A. While not definitely established, he advances the theory of the polymerization of the unsaturated hydrocarbons of the gas, such as endene, as a possible cause of meter deposits.

The presence of sudene in illuminating gas was first established by Dennstedt and Ahrens,[4] who isolated this compound by compressing illuminating gas and freezing the condensate to —20 oc. Cumaroni, another unsaturated body, is also present in artificial gas, and it is interesting to observe that both these unsaturated bodies readily undergo polymerization to a gummy mass. Traces of these unsaturated compounds were identified in the deposits taken from the Montreal Light, Heat & Power meters, but the quantity obtained was too insignificant to justify the above assumption.

An analysis made of the sludge taken from the meters of the Montreal Light, Heat & Power Company showed it to be of the following composition:

(Specific gravity 0.959)

Unsaponifiable Matter	% by Weight
1. Water	0.5
2. Hydrocarbons (volatile with steam)	12.0
3. Heavy hydrocarbons	2.6
4. NH_3 as $(NH_4)\ 2CO_3$	0.1
5. Sulphur	0.1
6. Mineral matter: traces of iron and tin	..
Total	15.3

Saponifiable Matter	
1. Unchanged neat's-foot oil	63.0
2. Glycerides of oxyacids	20.0
Total	83.0

Analysis also checked by outside chemist.

The steam volatile hydrocarbons were then distilled and the following fractions obtained:

Fraction No.	Temp. Range (Oc.)	% by Volume
1	90—120	17.3
2	120—140	36.3
3	140—160	65.6
4	160—180	90.0
5	180—195	97.0

The residue in the distillation flask was a solid mass, which was identified as naphthalene.

The methods of analysis need not be considered in this paper, except for a few notes on the separation of the insoluble oxyacids. After saponification of the de-

[3] A. G. A. Monthly, July, 1922

[4] Berl. Ber., 1894, p. 601.

posit, the alcohol of the solution is evaporated, the soap dissolved in water, the fatty acids liberated with mineral acid, the entire mass then transferred to a separatory funnel, any adhering fatty acids dissolved in ether and added to the contents of the funnel. The acid layer is "salted" out in order to decrease the solubility of the fatty acids in the aqueous solution, and the entire mass is allowed to settle. The insoluble oxyacids are then found between the aqueous acid solution and the ether layer, or adhering to the walls of the funnel. The fatty acids are filtered, dried with calcium chloride, and finally exposed for five minutes at 105 deg. Cent. to expel the last traces of moisture. The insoluble oxyacids are then dissolved in alcohol, dried and weighed. The oxyacids have a crystalline structure.

Neat's-foot oil, consisting as it does mostly of the glycerides of oleic acid, an unsaturated acid, gradually becomes converted into a saturated acid by absorbing oxygen, hydrogen in the presence of certain catalytic agents, etc. The oxyacids particularly produce a very hard fat and the mixture of these glycerides dissolved in the hydrocarbons imparts the consistency which the meter deposit possesses.

The effect of modern carbonization in aggravating this meter deposit now becomes obvious. High temperature carbonization has reduced the oily constituents of the gas, which not only protected the metal of the meters against corrosion but likewise helped to maintain in solution any solid fats produced in the meter dressing. Also, the modern tendency for heavier exhaustion pulls in a little extra air with the gas, with the consequence that the oxygen content of commercial gas has been enhanced. The increased quantity of oxygen has accelerated the time of saturation of the unsaturated glycerides found in neat's-foot oil. These two new factors—the diminution of solvent hydrocarbons and the increase of oxygen in the gas—have produced a new problem, "Meter Deposits: Their Prevention and Elimination."

The Cause of the Deposits

The cause of these meter deposits, then, is the employment of a glyceryl ester of an unsaturated fatty acid for a meter dressing. So long as a lubricant of animal or vegetable origin is to be employed, the cause still remains. Hence the adoption by many companies of the neutral straw oil, which is of mineral origin. But this change is like jumping from the frying pan into the fire; for mineral oil does not produce the emollient properties nor does it exert the protective influence on leather that neat's-foot oil does, and the mineral oil dressed leather leaches, hardens and decays much more rapidly than leather dressed with neat's-foot oil. One is therefore willing to employ neat's-foot oil with its accompanying defect—formation of the objectionable sludge described above. Perhaps the next step will be the finding of a leather substitute, a material which will have similar physical properties to that of leather but which will be able to maintain these desirable characteristics in the face of new conditions created by modern high temperature carbonization.

Not the Chief Difficulty

Hardening or bleaching of the leathers is not the chief difficulty experienced with the meters of the Montreal Light, Heat & Power Company, but rather the presence of this thick syrup in the bottom of the meter, outside the leather. Now, it is customary at our meter shops to pour in about 3 oz. of pure neutral neat's-foot oil through the slide valves into the diaphragm, and this operation is repeated after five years' service when the meter is reinspected. After ten years' service, when the fronts and backs are generally renewed, this sludge is removed. Trouble with the leather diaphragms owing to hardening or bleaching has not been serious, for of the 36,000 meters annually inspected the number of leathers found to be hard or bleached does not exceed one-half of 1 per cent. Following is a tabulation showing the conditions of meter diaphragms and meter deposits. Very old meters were purposely chosen for examination; which, of course, makes the percentage of hard and brittle leathers appear high.

Meter Deposits and Meter Diaphragms

Diaphragm Last Examined	Character of Meter Deposit	Condition of Leather Diaphragm
1898	Soft	Soft
1898	Medium	Soft
1898	Heavy	Soft
1901	Hard	Medium
1901	Medium	Medium
1903	Hard	Medium
1904	Hard	Hard
1905	Heavy	Hard
1905	Heavy	Hard
1915	Light	Soft
1899	Heavy	Hard
1899	Heavy	Hard
1899	Heavy	Hard
1900	Hard	Hard
1900	Light	Hard
1902	Light	Medium
1903	Heavy	Hard
1905	Light	Hard
1905	Light	Hard
1905	Light	Hard
1919	None	Very soft
1919	None	Very soft
1913	Soft	Soft
1918	Soft	Soft

Unfortunately, the behavior of meters under apparently similar operating conditions does not lead to similar conditions of diaphragms after many years of service. A dozen meters of the same make, of the same seal date, and all having been in service for fifteen years without having their fronts or backs removed, had about 40 per cent that showed a fairly large accumulation of a heavy deposit, while the remainder would be quite free from this.

Similarly, some meters in operation for twenty-five years have perfectly good diaphragms, while with others the diaphragms perish in about fifteen years of operation. With regard to defective leathers, therefore, it is difficult to establish a basis or to arrive at a conclusion within any reasonable degree of accuracy as to the possible life of the leather or the reason for its hardening and perishing. Our records show that 30 per cent of leathers perish after fifteen years' service and 50 per cent after twenty years' service. At present our meter department is carrying out investigations with a view to ascertaining

what effect local conditions have upon the useful life of leather diaphragms.

In cleaning old meters where the fronts and backs have been removed, the best solvent found for this deposit is benzol. In using this material, however, great caution must be observed, for benzol is one of the best solvents for fat and on account of its low vapor pressure great care must be taken not to inhale this substance. The solvent action of benzol is so great that when the vapors are inhaled it acts as a solvent for the body fat, allowing the lodging of fat emboli in the small vessels, thus causing their rupture. Sometimes hemorrhages from the nose, lungs and gums occur. The symptoms that follow the inhalation of benzol vapors depend on the susceptibility of the individual. Hoarseness, sore throats and nosebleed among the men were parts of our own experience, and even absorption through the skin affected heart action. In mild cases it brings about dizziness, confusion and violent headaches. During the war several fatalities occurred due to benzol poisoning,[5] as in the case of cleaning benzol steels, operating sulphonating vats, etc. Some of our men suffered from headaches, nausea and vomiting, owing to carelessly handling the benzol. Unless one is prepared to follow out instructions carefully, it is best not to use this excellent solvent for meter deposits. The metal casing is, of course, best cleaned with a dilute solution of caustic soda, which signifies the fatty matter and the resulting soap formed is easily washed out.

As a matter of interest I submit a small tablet of soap made from this old oxidized meter deposit. I can guarantee it as antiseptic if not fragrant.

[5] Industrial Accidents and Hygiene Series No. 14, U. S. Department of Labor

A Written Promise Becomes a Contract

The public could undoubtedly stand for a lot of advance information regarding the future intentions of its utilities, such as is given the people of Pasadena, Cal., in

this sign posted beside the open trench "where he who runs may read." Mr. Public realizes that this company is making good on a promise made last winter, when a gas shortage threatened, and his heart is softened as a consequence. He has, in times past, had trouble in placing responsibility for failure in service or accommodation, and has felt that he was being put off with rosy promises made by uninformed clerks hirde, no doubt, to keep him pacified until some department could catch up with its work.

This sign puts him in an understanding mood, as he realizes that perhaps, after all, any business enterprise—public utility or grocery store—is only a group of individuals who carry their respective responsibilities, even as you or I, and maybe as a group are even more powerful to fulfill a promise. Anyway, a *written* promise to do something is pretty sure to be followed by the promisor making good.

Ignition Temperature of Coal

In an interesting paper, Ray W. Arms, in the Illinois University Bulletin, summarizes his conclusions in the following words:

(a) The "ignition temperature" of coal means nothing unless it is applied to some definite point in the process of heating the coal which can easily be determined and duplicated.

(b) The temperature at which the coal glows seems to be the most logical point to choose as the ignition temperature. It is easily observed, can be duplicated with a fair degree of accuracy, and marks the beginning of visible combustion.

(c) The glow point is probably affected by the oxygen contents of the coal, and perhaps by other agencies made active by weathering.

(d) The glow point is not affected by ash, moisture, size of particles, slight variation from the normal air supply, nor by the rate of heating.

(e) There is at present no indication that the glow point bears any direct relation to the liability to fire while in storage. Perhaps if a series of tests were made on the glow points of freshly mined coal, new information would be brought to light which would lead to the discovery of some more definite relation between the glow point and the firing qualities of the coal.

Suspended Matter in Gases

Tar and suspended matters are removed from manufactured gas used for domestic and industrial purposes. This removal is made not only because of the commercial value of these materials but also on account of the trouble they cause in purification processes by collecting in pipes and by gumming the mechanism of gas meters. In connection with tar removal and with the operation ot gas plants, tar and other suspensoids in gas have been determined by filtering a measured volume of gas and weighing the tar caught. Filters used for this purpose have been made of cotton wool, granulated sugar, alundum and paper. In studying gum-forming constituents in gas, the Bureau of Mines had occasion to determine the amount of suspended matter; of the methods available, the method using filter paper may be applied most simply by means of the "tar camera," which is a flanged union for clamping the papers so that gas samples may be passed through. The papers may be weighed before and after the test, or compared with a color chart provided for estimating the weight of tar by the degree of stain on the paper. The results of a laboratory investigation of the accuracy of the tar camera are given in Serial 2378, "Determination of Suspended Matter in Gases by Collection on Filter Paper," which may be obtained from the Bureau of Mines, Washington, D. C.

Public Utilities Securities Market Report

Prices of Representative Gas Bonds

(Quotations furnished by The National City Company)

Company	Issue	Maturity	Sept. 7, 1922 Bid	Asked
American Lt. & Trac. Co.	Five Year 6s	May 1, 1925	107½	108½
Brooklyn Union Gas Co.	First Consol. 5s	May 1, 1945	98¼	99¼
Columbia Gas & Elec. Co.	First 5s	May 1, 1927	96	96¾
Consol. Gas, Elec. Lt. & Pr. Co. of Baltimore	First Ref. 7½s	Dec. 1, 1945	110	111
Consol. Gas, Elec. Lt. & Pr. Co.	General 4½s	Feb. 14, 1935	91½	92½
Consol. Gas Co. of New York	Sec. Conv. 7s	Feb. 1, 1925	102	—
New Amsterdam Gas Co.	First Consol. 5s	Jan. 1, 1948	85	86
Denver Gas & Elec. Co.	Gen. (now 1st) 5s	May 1, 1949	93	—
Detroit City Gas Co.	Gold 5s	Jan. 1, 1923	100	—
Equitable Illum. Gas Lt. Co. of Philadelphia	First 5s	Jan. 1, 1928	99	100
Hudson County Gas Co.	First 5s	Nov. 1, 1949	91	93
Laclede Gas Light Co.	Ref. & Ext. 5s	Apr. 1, 1934	93½	96
Louisville Gas & Elec. Co.	First & Ref. 7s	June 1, 1923	100¼	101¼
Michigan Light Co.	First & Ref. 5s	Mar. 1, 1946	89	91
Milwaukee Gas Light Co.	First 4s	May 1, 1927	92½	93
Pacific Gas & Elec. Co.	Gen. & Ref. 5s	Jan. 1, 1942	93½	94
Pacific Gas & Elec. Co.	First & Ref. 7s	Dec. 1, 1940	107	108½
Cal. Gas & Elec. Corp.	Unif. & Ref. 5s	Nov. 1, 1937	96½	97½
Peoples' Gas Lt. & Coke Co.	Refunding 5s	Sept. 1, 1947	96	96½
Chicago Gas Lt. & Coke Co.	First 5s	July 1, 1937	97	99
Portland Gas & Coke Co.	First & Ref. 5s	Jan. 1, 1940	91	—
Seattle Lighting Co.	Refunding 5s	Oct. 1, 1949	82	84
Southern California Gas Co.	First 6s	Nov. 1, 1950	98	—
Utica Gas & Electric Co.	Ref. & Ext. 5s	July 1, 1957	90¾	—
Washington Gas Light Co.	General 5s	Nov. 1, 1960	94	95
Western States Gas & Elec. Co. of California	First & Ref. 5s	June 1, 1941	91	92

Demand for Gas Company Securities

Worcester, Mass. — A sudden and unaccountable demand for Worcester Gas Light Company common stock took Worcester brokers by surprise last week. The stock has been comparatively inactive for the last three weeks, and has been offered around 80. The first sale of the day was 82, later 85 was freely bid for the issue, and it is understood it sold at 90 in Boston. Officials of the gas company could offer no explanation for the strength and unusual demand. The company is running along about the same as usual and, while in a much better positon than at any time in the last few years, so far as can be learned, there is nothing new either in earnings or in prospects that would cause the stock to jump ten points in a single day.

Earnings Increased

Pawtucket, R. I.—Blackstone Valley Gas & Electric Company reports for July gross earnings of $291,744 and net $91,764, increases, respectively, of $14,899 and $9,047 over July, 1921. For the twelve months ending July 31, the gross income was $3,904,625 and net $1,441,520, increases of $499,604 and $476,381 respectively over the previous twelve months. The surplus after charges July 31 was $1,107,201 in comparison with $635,590 July 31, 1921.

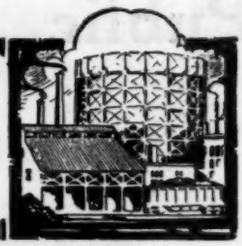
Street Lighting Report Made

Greenfield, Mass.—The committee appointed by the Greenfield Chamber of Commerce to investigate street lighting in the residential section, has made its report, which has been accepted by the board of directors. A complete survey and inspection of every street light in Greenfield was made by Harry Dureen, of the Greenfield Light & Power Company, and a map has been prepared by him showing the location of every street light. A copy will be placed in the selectmen's room, for information when complaints are made regarding the need of additional lights. The committee found that by trimming trees generally throughout the town, the system was greatly improved, without any material expense.

Warns of Frauds

Athol, Mass.—The Athol Gas & Electric Company in a special statement warned Athol residents to beware of fake salesmen or fraudulent meter readers. The company calls attention of the public to the fact that they have only one salesman in Athol, T. Francis Hannigan, and two salespeople in Orange, Misses Maude Hobbs and Reta Holland. The company warns Athol residents that they will not be responsible in any way for the grossly exagerated statements of those representing themselves to be from the Athol Gas & Electric Company. The company calls attention to the fact that its official meter reader is J. Albert McDonald and warns the people not to let anyone else who purports to be an agent enter their homes. They request such cases be immediately reported to the company or police.

NEWS OF THE GAS INDUSTRY



Massachusetts Gas Companies

Boston, Mass.—The 107 per cent increase in July net earnigs of Massachusetts Gas subsidiaries over July a year ago is likely to prove the forerunner of a string of similarly large gains throughout the winter months, according to the Boston *News Bureau*. Notwithstanding the coal mines owned by Massachusetts Gas operating companies only recently reopened after having been shut down since the first of the year, the consolidated net income of the system for the seven months to July 31 totaled $1,676,720, an increase over a year ago of $127,000.

Massachusetts Gas has outstanding $25,000,000 4 per cent ferred stock and $25,000,000 of common on which it is paying at the rate of $5 a share per annum. In other words, dividend requirements of the holding company total $2,250,000 per annum, as against operating earnings so far this year at a rate substantially in excess of these requirements.

The interesting side to the Massachusetts Gas situation, however, is that earnings during the coming winter are morally certain to show a considerable expansion. It would not be surprising if the consumption of gas, reflecting the certain scarcity of hard coal, were to increase 25 per cent over a year ago.

In the New England Coal & Coke Company, Massachusetts Gas has another probable strong earner this winter. Those who are unable to get coal are purchasing coke up to and beyond the company's capacity to deliver at this early date. In all probability when the weather grows colder the company will be swamped with orders, but to prepare for this contingency it has ordered large quantities of coal from Canadian and British producers; furthermore, it will probably be liberally treated in the matter of domestic coal priorities inasmuch as its output of gas will go directly to gas plants, while its coke output will provide a certain amount of relief for coal consumers in this section of the country.

Massachusetts Gas has still other strings to its bow. As already stated, the company is directly interested in the production of coal through ownership of mines and furthermore it sells a large tonnage on commission besides operating a fleet of colliers.

Through its ownership of 47½ per cent of the common stock of the Beacon Oil Company at Everett, Massachusetts Gas is in line to participate in whatever increased demand falls upon the oil refineries as a result of the coal shortage.

It is worth remarking that this winter, for the first time, all departments of Massachusetts Gas will be pulling together whereas the rule has been that if gas earnings were good the commercial department was falling behind, and vice-versa.

From a long-range standpoint there is more to the coming winter's prospects than a mere temporary increase of profits. The Massachusetts Gas Companies expect to retain a substantial part of the new business gained this winter. This will be exactly in accordance with the precedent of the 1902 coal strike and the acute scarcity of coal during the war.

Prior to Nov. 1 last Massachusetts Gas had been paying $7 a share on its common. It was necessary to cut the rate to $5 in view of unsatisfactory earnings and by the same token the prospective improvement may be expected to arouse hopes of a restoration of the dividend. There is little doubt that the profits of ensuing months will justify this course, but the coal labor outlook for next April 1, when the present soft-coal agreement expires, may be such as to temper the optimism engendered by improving earnings.

Colorado Incorporations

The Associated Coal Company, incorporated for $50,000. Home office, Denver, and the incorporators are William R. Lynch, Ernest Drexel and John A. Barstow.

The Super-Oil Company, incorporated for $50,000. Home office, Denver, and the incorporators are William H. Malone, William H. Malone, Jr., and Lanford S. Slaton.

Pays Large Tax

Warren, R. I.—The Bristol County Gas Company will pay a tax of $2,632 to the town of Warren for the year 1922, and the Narragansett Lighting Company $1,624. The list of large taxpayers of Warren were announced by the board of assessors, who also announce that the total tax to be collected this year at $173,083.80.

Gasman Marries

Springfield, Mass. — Benjamin Lawrence Smith, an inspector of the Springfield Gas Light Company, and Miss Mae Veronica Walsh, daughter of Mr. and Mrs. James Walsh, of Roseland Street, were married in All Souls' Church, by Reverend Owen McGee, pastor of the church. The attendants were Raymond Donlin and Miss Helen Driscoll. Mr. and Mrs. Smith left for an automobile trip to Washington, D. C., and will make their home at 37 Grenada Avenue, upon their return September 18.

To Install High-Pressure Condenser

In addition to the carbureted water-gas apparatus recently installed by the U. G. I. Contracting Company, of Philadelphia, Pa., for the Queens Borough Gas & Electric Company at its Rockaway Park plant, the former company has been commissioned to install an additional 8 ft. 6 in. by 22 ft. high-pressure condenser.